

POLICIES AND MEASURES FOR RENEWABLE ENERGY SOURCES AND ACHIEVEMENT OF TARGETS BY 2020 IN CROATIA

by

Igor RAGUZIN^{a*}, Davor VEŠLIĞAJ^b, and Vladimir JELAVIĆ^b

^a Ministry of Economy, Labour and Entrepreneurship, Zagreb, Croatia

^b EKONERG, Energy and Environmental Protection Institute, Zagreb, Croatia

Original scientific paper
UDC: 620.97:504.7
DOI: 10.2298/TSCI1003569R

This paper is considering set up a longer-term perspective and plan of actions for the development of renewable energy infrastructure in Croatia in accordance with the new Croatian Energy Sector Development Strategy. Overall target till the year 2020 has been calculated in accordance with effort sharing methodology used for Directive 2009/28/EC. The paper presents some main existing policies and measures for achieving this ambitious target, including feed-in tariffs, guarantees of origin, and greenhouse gas emissions taxation. It is addressed the necessity for creating enabling environment for promotion of renewable energy sources and gradually remove barriers for its stronger penetration on the energy market.

Key words: *policies and measures for renewable energy, Croatia renewable energy target, Directive 2009/28/EC, RES support schemes*

Introduction

The objectives set out in the EU climate change and energy policies can only be achieved by significantly increasing the share of renewable energy sources (RES) in energy consumption, including electricity, heating and cooling, and transport. Reaching the target will significantly mitigate greenhouse gas emissions, reduce fossil fuel consumption and initiate development, commercialization, and diffusion of technologies and domestic industries, thus stimulating economic growth and employment.

For pursuing promotion of RES in Croatia there is a need to take a closer look at where we stand now and which measures, instruments, and activities we shall set out and implement in order to reach the targets. This paper sets out a framework for such action.

The EU invites Croatia to set an appropriately ambitious target for the percentage of electricity produced from RES to be achieved by the deadline set in Directive 2001/77/EC, and commensurate with the objective to achieve an increase in the EU's share of RES consumption from around 7% in 2005 to 20% in 2020, as agreed by European Council in March 2007 [1].

* Corresponding author; e-mail: igor.raguzin@mingorp.hr

The goal of the new Croatian Energy Sector Development Strategy (OG 130/09) is to build a sustainable energy system with balanced development of relations between environmental protection, competitiveness and security of energy supply, which will enable energy supply to Croatian citizens and economy, under the conditions of uncertain situation in the global energy market and with scarce local energy resources. One of the specific tasks of the Strategy is to set targets for RES in accordance with the EU approach and targets as outlined in the EU energy and climate change policy package.

Current state of policies and measures for RES and achievement of indicative targets by 2010 in Croatia

Policy and measures for production of electricity from RES

Directive 2001/77/EC on the promotion of electricity produced from RES [2] has been transposed in the national legislation through the:

- Energy Act (OG 68/01, 177/04, 76/07, 152/08),
- Electricity Market Act (OG 177/04, 76/07, 152/08),
- Act on Regulation of Energy Activities (OG 177/04, 76/07),
- Tariff system for the production of electricity from RES and co-generation (OG 33/07),
- Regulation on fees for promoting electricity production from RES and co-generation (OG 33/07, 133/07, 155/08),
- Regulation on the minimum share of electricity produced from RES and co-generation whose production is incentivized (OG 33/07),
- Ordinance on the use of RES and co-generation (OG 67/07), and
- Ordinance on attaining the status of eligible electricity producer (OG 67/07).

By the Regulation on the Minimum Share of Electricity Generated by Renewable Energy Sources and Co-generation whose generation is incentivized (OG 33/07), the target is set for the end of 2010. Minimum share of renewable sources (without hydro power plants of installed capacity greater than 10 MW) in electricity generation should be 1,100 GWh per year, which will make 5.8% of total electricity in the year 2010.

The implementation of the above-mentioned secondary legislation has begun on July 1, 2007. At the moment Croatian legislation does not define the guarantees of origin (GoO) nor designate the competent body responsible for all relevant aspects in relation to the guarantees of origin. It is proposed that the Electricity Market Act should be amended as to define the GoO scheme, and its position, within the Croatian electricity market and to determine the rights and obligations of the electricity subjects within the GoO's scheme.

In order to facilitate activities necessary for implementation of RES legislation at the Ministry of the Economy, Labour and Entrepreneurship (MoELE), fully co-ordinating activities with Market operator (MO) and, as necessary, with Transmission System Operator (TSO), Distribution System Operator (DSO), and Croatian Energy Regulatory Agency (HERA), the Register of Projects and Facilities for the Production of Electricity from RES and co-generation and of Privileged Producers" (RERCPPP) [3] was set up and all the stakeholders and the public will to certain extent have access to its content.

The legislative framework for RES established in 2007 sparked off immense interest on the part of investors in the construction of a facility for the generation of electricity from RES. As a result, quite a number of investors applied for the status of eligible producer of elec-

tricity. In the period observed, more than 300 applications for the status of eligible electricity (privileged) producer and for the acquisition of the provisional energy production license were entered into the RERCPMP, which has been set up and is operated by the MoELE. The MoELE has received 379 requests in the period until September 1, 2009, which are prosecuted through administrative proceedings: 46 requests from solar power plants PV, 97 requests from small hydro power plants, 22 requests from biogas power plants, 19 requests from biomass power plants, 12 requests from high-efficiency co-generation plants, 180 requests wind power plants, 1 request from geothermal power plant, 1 request from landfill gas power plant, and 1 power plant using gas from waste water treatment plant.

Policies and measures for using biofuels

The current legislative framework related to promotion of biofuels production includes:

- Energy Act (OG 68/01, 177/04, 76/07, 152/08),
- Act on biofuels for transport (OG 65/09),
- Regulation on the quality of biofuels (OG 141/05), and
- Government's incentives in Agriculture, Fisheries and Forestry Act (OG 87/02, 141/06).

Regulation sets out the national indicative target of 5.75% of biofuels in total share of fuels by 2010.

The Act on biofuels for transport regulates general and specific issues in the field of biofuels along with implementing regulations which will be adopted on the basis of the Act and thereby provide a basis for a systematic development of the biofuels market. This Act regulates production of, trade in and storage of biofuels and other renewable fuels, use of biofuels in transport, adoption of programmes and plans for the promotion of production and use of biofuels in transport, powers and responsibilities for establishment and implementation of the policy aimed at promoting production and use of biofuels in transport, as well as the measures to stimulate production and use of biofuels in transport.

In order to reach this target Government determines the yearly percentage of biofuels in total share of fuels and yearly amount of biofuels that should be placed on domestic fuel market, which is formalized by annual plans. With a view to achieving the national indicative target, the Government issued the Decision establishing the annual percentage of biofuels in the total share of energy fuel consumption to be placed on the domestic market in 2008 (OG 52/08), amounting to a share of 1.21%, representing an equivalent of 1.13 PJ of biofuels.

Currently, there are three facilities for production of biodiesel from rapeseed and used edible oil in Croatia with total capacity of 69,000 tones. The construction of new production facilities with larger capacities is underway. The key issue for supplying production capacities is the lack of domestic feedstock which should be ensured by stronger stimulation in agricultural sector and establishment of partnerships between farmers and biofuels producers.

Policies and measures for promotion of using RES in heating and cooling

Preparation of secondary legislation on the promotion of heating and cooling from RES is based on the provisions from the Production, Distribution and Supply of Heating Energy Act (OG 42/05) but still in early stage of development. Concept is similar to one developed for production of electricity from RES which means that following elements should be defined: eligibility of producer, source and amount of financial support, and minimum share of heating (and

cooling) energy. There will be fundamental difference in financial support scheme for producers of heating and cooling energy since these systems have constraints in production distribution and supply in comparison to electricity production and as such could not be feed-in as latter but more centralized financial support is needed. Recommendation is to utilize financial sources collected by Energy Efficiency and Environmental Protection Fund [4].

National 2020 target

National RES action plan aims to establish an overall binding target and indicative pathway for RES to be achieved by 2020 in Croatia.

This target is been calculated in accordance with Directive 2009/28/EC [5] and methodology described in Impact assessment document [6]. The Directive sets up an ambitious target for the overall share of energy from RES in gross final energy consumption, which equals 20% and for the share of energy from RES in transport, mainly biofuels, which equals 10%. This effort is achieved with the approach where part of the effort is apportioned as fixed percentage, *i. e.* 5.5%, and remaining part of the effort is modulated by GDP/capita index ("effort per citizen"):

- the share of RES in 2005 is the base year for the calculation of the target taking into account national starting points and efforts already made (if growth in RES was more than 2% over 2001-2005 a reduction of 1/3 of that growth from the 2005 base year share is received),
- 5.5% is added to the 2005 share of RES adjusted for efforts already made,
- the remaining effort is weighted by a GDP/capita index and multiplied by population,
- these two elements are added together to derive the full RES share of total final energy consumption in 2020, and
- a cap is placed to ensure that the target is not 50% or more of energy mix.

The gross final consumption of energy means the energy commodities delivered for energy purposes to manufacturing industry, transport, households, services including public services, agriculture, forestry, and fisheries, including the consumption of electricity and heat by the energy branch for electricity and heat production (energy own use) and including losses of electricity and heat in distribution and transmission.

The gross final consumption of energy from RES shall be calculated as the sum of:

- gross final consumption of electricity from RES,
- gross final consumption of energy from RES for heating and cooling, and
- final energy from RES consumed in transport.

Following cases are excluded from calculation or adjusted for calculation of share of energy from RES:

- biofuels and other bioliquids that do not fulfill the environmental sustainability criteria in Article 15 of the Directive [5],
- in multi-fuel plants using RES and conventional sources, only the part of electricity produced from RES sources shall be taken into account, and
- production of electricity by pumped storage units using water that has previously been pumped uphill.

The share of RES in Croatia was 12.65% in 2005, with 7.31% from hydro power (taking into account normalization rule from Annex II to the Directive [5]), 5.31% from biomass and 0.03% from other sources for electricity production.

Taking into account the approach used for calculation of the share of energy from RES [5], overall target for Croatia equals 20.09% of RES in gross final energy consumption in 2020.

$$\text{Target in 2020} = \text{RES}_{2005} + \text{Ui} + \text{Ref} = 12.65 + 5.5 + 1.94 = 20.09 \%$$

RES_{2005} – share of RES in gross final consumption in 2005, 12.65%

Ui – uniform increase, 5.5%

Ref – residual effort, 1.94%

$$\text{Ref} = (\text{GDP}(\text{CRO})_{2005} / \text{GDP}(\text{EU27})_{2005} \cdot \text{REF}_{\text{EU}} \cdot \text{POP}) / \text{GFC} \cdot 100\%$$

$$(\text{GDP}(\text{CRO})_{2005} / \text{GDP}(\text{EU27})_{2005} = 0.263 \text{ [7]}$$

REF_{EU} = residual effort per average EU citizen, 0.16 toe/citizen

POP = Croatia population in 2005, 4,444,000

GFC = gross final consumption, projected in 2020, 9,657,000 toe

In relation to 2005 when the RES share amounted to 12.65%, this presents a significant increase of the RES share in final energy consumption, what requires redefining of the current RES policy, as well as additional efforts of the government aimed at enhancing and improvement of the schemes for RES promotion. Indicative intermediate targets in period till 2020 are calculated in accordance with Annex I Part B of the Directive [5] (see tab. 1):

Table 1. Indicative intermediate targets for RES

Period	Increase above level in 2005	As average share of the two years period
2011-2012	20%	14.1%
2013-2014	30%	14.8%
2015-2016	45%	15.9%
2017-2018	65%	17.4%

are calculated in accordance with Annex I Part B of the Directive [5] (see tab. 1):

National target for the share of RES was set taking into account projections of final energy consumption from Green paper on Energy Strategy of the Republic of Croatia [8]. “Sustainable scenario” from Green paper was selected as a reference case, which has a lower annual growth in of final energy consumption in comparison with “Business-as-usual” scenario*. According to former scenario, final energy consumption in 2005, which equals 6653.8 toe, will increase by rate of 2.5% per year and will reach 9,657 toe in 2020. Tables 2 and 3 shows Forecast of gross final energy consumption in Croatia 2020 and Forecast of total RES in Croatia 2020 [7, 9].

Figure 1 gives comparison of target across EU countries and Croatia.

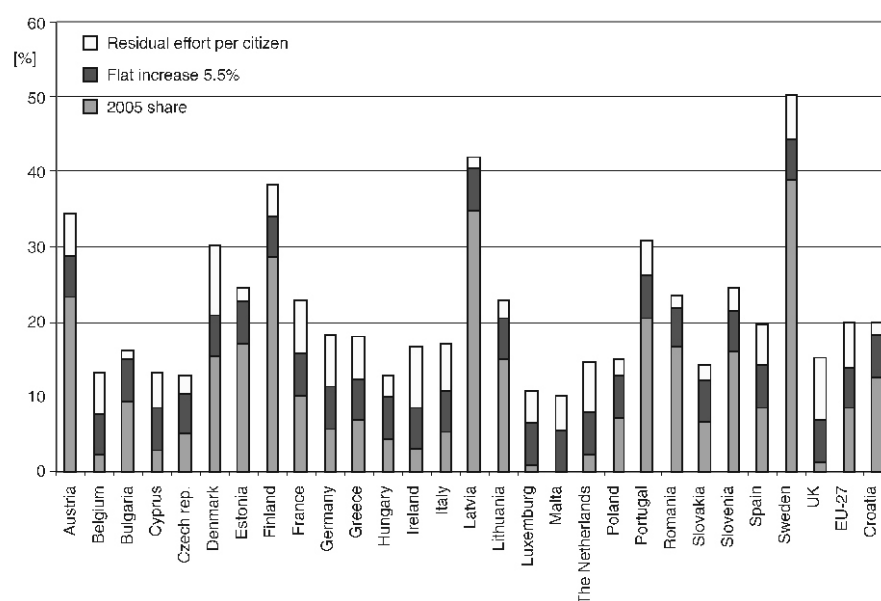
Table 2. Forecast of gross final energy consumption in Croatia, 2020

Title	2005 1,000 toe	[%]	2020 1,000 toe	[%]
Final energy consumption	6,326	95.5	9,295	96.3
Consumption of the electricity and district heat production branch	73.6	1.1	116.6	1.2
Losses in transmission and distribution of electricity and district heat production	223	3.4	244	2.6
Total gross final consumption of energy	6,622.6	100	9,657	100

* The both scenarios were adopted in Energy Sector Development Strategy (OG 130/09)

Table 3. Forecast of total RES in Croatia, 2020

Title	2020 1,000 toe
Gross electricity from hydro power (excl. pumped storage)	534.2
Gross electricity from other RES	329.5
Gross final of heat and steam from district heating systems	243.9
RES in final consumption (transport, heating, and cooling)	832.3
Total RES	1,940.0
The share of RES in 2005	20.09%

**Figure 1. Structure of RES targets across EU countries and Croatia in 2020**

Contribution of different RES technologies to the overall target by 2020

Table 4 shows the RES structure in Croatia foreseen in the new Energy Sector Development Strategy [10]. As could be seen from tab. 4, the greatest grow is planned in use of biomass, wind energy and biofuel. Hydro energy will be stay nearly constant, but more than 500 MW hydro capacities will be constructed for peak load covering. In setting target, feasible share of total RES potential are supposed for biomass, taking in to account food security and sustainability of forest.

Table 4. Forecast of gross final and final energy consumption of the RES to 2020

Technology	2010 [PJ]	2020 [PJ]	Increase
	Gross final	Gross Final	2020/2010
Biomass	16.03	27.50	1.7
Biofuels	2.59	8.91	3.4
Wind energy	0.61	9.24	15.1
Hydro power – small	0.40	0.97	2.4
Hydro power – large	21.06	23.76	1.1
Geothermal energy	0.15	1.13	7.5
Solar energy	0.12	5.50	45.8
Other	0.94	4.21	4.5
Total	41.90	81.22	1.94

Biomass – Targets

To utilize 22% of total estimated potential of wood biomass (without energy forests), which equals 18.14 PJ by 2010.

To utilize 40% of total estimated potential of wood biomass (without energy forests), which equals 36.27 PJ by 2020.

Biofuels – Target

To realize an annual domestic production of biofuels amounting to 340,231 tonnes and an additional 3,800 tonnes obtained from waste edible oil by 2020.

Wind energy – Target

To install 1,200 MW in wind power by 2020.

Hydro power (small) – Target

To produce 270 GWh in small hydro power plants by 2020.

Geothermal energy – Targets

The aims of this Strategy with regard to the exploitation of geothermal energy are:

Exploitation of medium temperature basins to develop business zones where geothermal power stations would be the central business complex.

Constructing pilot project geothermal power station and business zone by 2011 where the co-ordinating role would be the responsibility of the local government with the support of regional and state government.

Constructing 3 geothermal power plants with business zone by 2020.

Solar energy – Targets

Two objectives have been set in the Strategy with reference to the exploitation of solar energy:

The situation with regard to solar heating systems in Croatia by 2020 shall be equal to the level in Germany and Greece on per capita basis (objective of 0.225 m² per capita).

The situation in Croatia with regard to the state photovoltaic power by 2020 shall be equal to the situation in Spain today (11.71 W per capita), and Germany by 2030 (over 45 W per capita).

Development of support scheme for RES promotion in Croatia

Support scheme means a scheme, originating from a market intervention that helps energy from RES to find a market by reducing cost of production of this energy, increasing the price at which it can be sold, or increasing, by means of a RES obligation or otherwise, the volume of such energy purchased taking into account state aid provisions.

Feed-in tariffs

Croatia has already implemented support mechanism for production of electricity from RES which is stipulated by following regulation:

- tariff system for the production of electricity from RES and co-generation (OG 33/07), and
- regulation on fees for promoting electricity production from RES and co-generation (OG 33/07, 133/07, 155/08).

The regulation on fees for promoting electricity production from RES and co-generation (OG 33/07) prescribes that all electricity buyers – tariff buyers and eligible buyers – shall pay an Incentive fee to their suppliers.

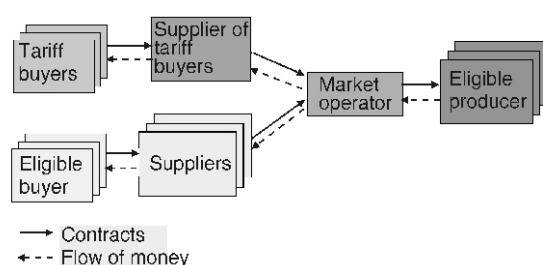


Figure 2. Feed-in tariff support mechanism scheme for electricity production from RES in Croatia

(HROTE) pays the eligible producer an incentive price in accordance with the respective tariff system (fig. 2).

Guarantee of origin and green certificates

The guarantee of origin system for electricity produced from RES and high-efficiency co-generation will be regulated and transposed fully and appropriately in terms of quality by CARDS 2004 project "Approximation of EU Renewable Energy Legislation and Energy Efficiency Labelling – RELEEL" [11] by the end of 2010.

Croatian law does not define the guarantees of origin nor designate explicitly the competent body responsible for all relevant aspects in relation to the guarantees of origin. The only

mention on the guarantees of origin, in a very limited manner, is given by the Electricity Market Act (OG 177/04, 76/07) and by the Electricity Market Rules (OG 135/06). The recommendations for establishment of complete legislative framework for GoO are as follows.

Amend the Electricity Market Act to define:

- issuing body for GoO and obligation for administering the data base of GoO,
- to whom the GoO should be issued, and
- by-law in which all details elated to GoO system are prescribed.

Prepare and adopt by-law (Government regulation on GoO) to specify all details related to the GoO system in Croatia. This regulation should contain: purpose of GoO; the content of the GoO, its legal nature and form; the organisation of GoO's system as such; the conditions for issuing the GoO; the procedure for issuing of the GoO; the details regarding register of GoO; the legal remedies related to the decision on issuance of the GoO; instruments related to missus of the GoO; the cover of the cost of such system (*e. g.* a fee for inscription in the register).

Based on the results of the performed analysis, it is strongly recommended to legally appoint the market operator (HROTE) as a competent body for issuing GoO and complete administering GoO system in Croatia.

CO₂ emissions taxation

CO₂ emissions taxation is stipulated by Regulation on unit tax, corrective coefficients and criteria for CO₂ emissions taxation (OG 73/07). At present, purpose of CO₂ tax is twofold, first to impose price on carbon in order to stimulate operators to reduce CO₂ emissions and second to ensure stabile flow of financial resources needed to credit environmentally sound projects, particularly in RES and energy efficiency. The unit tax for CO₂ emissions is at the level of 14 HRK (1.9 €) for 2008 and will increase to 18 HRK (2.5 €) in 2009.

Croatia will joint EU Emission Trading System upon the accessions to EU, at this time emission taxation system will be reconstructed, to relieve ETS operators from taxation, but probably to introduce new taxation in non-ETS sector.

Conclusions

The actual energy price increase and the imbalance on the world energy market indicate the need of urgent strengthening of mechanisms for mitigating the threat imposed by high prices and occasional energy shortages. The use of RES is the key prerequisite for establishing the flexible energy system providing for energy supply security and competitiveness. Croatia has undoubtedly abundant resources in all RES technologies, as well as excellent resources in some of them. Evident is the significant interest of investors for development and realization of RES projects, in particular for wind power plants. Within the negotiating process on EU access of the Republic of Croatia as the member country for the purpose of meeting the criteria for closing of the Chapter, the estimate of the RES target for 2020 was made in line with the defined methodology.

Taking into account the approach used for calculation of the share of energy from RES, overall target for Croatia equals 20.09% of RES in gross final energy consumption in 2020. This presents 1.940 Mtoe. In relation to 2005 when the RES share amounted to 12.65%, this presents a significant increase of the RES share in final energy consumption, what requires redefining of the current RES policy, as well as additional efforts of the government aimed at en-

hancing and improvement of the schemes for RES promotion. Correspondingly, the development of the new economic instruments for RES promotion is necessary.

The legal, economic-financial and institutional options of improvement of the system of origin guarantee is essential, as well as the introducing of the green certificates system for proving of the origin of a particular amount of energy from renewable sources. It is essential to remove the shortcomings in the legal system outside the system within the competence of the energy sector, which present obstacles to the more expedient and streamlined realization of the RES projects, in particular the micro power plants.

Apart of the development of the RES market a number of positive impacts would be achieved related to the social national interest, such as the energy supply security, economic growth, employment and development of small and medium entrepreneurship, savings and rational exploitation of the energy, what has direct impact to rationalization of State budget spending, as well as the increase of competitiveness of industry.

Nomenclature

ETS	– emission trading system	MO	– market operator
GDP	– gross domestic products	Mtoe	– million ton of oil equivalent
GoO	– guarantee of origin	OG	– Official gazette
HERA	– Croatian Energy Regulatory Agency	RES	– renewable energy sources
HRK	– Croatian Kuna – official currency of the Republic of Croatia		

References

- [1] ***, Commission's Draft Common Position, Chapter 15 Energy, February 28, 2008
- [2] ***, Directive 2001/77/EC of the European Parliament and of the Council of September 21, 2001 on the promotion of electricity produced from RES in the internal electricity market
- [3] ***, RES & COGEN projects Registry, www.mingorp.hr
- [4] ***, Energy Efficiency and Environmental Protection Fund, www.fzoeu.hr
- [5] ***, Directive 2009/28/EC of the European Parliament and of the Council on the promotion of the use of energy from renewable sources and amending the subsequently repealing Directive 2001/77/EC and 2003/30 EC, April 23, 2009
- [6] ***, Impact Assessment document accompanying the Package of Implementation measures for the EU's objectives on climate change and renewable energy for 2020, SEC(2008) 85/3
- [7] ***, UROSTAT – ENERGY Yearly statistics 2006, ISSN 1830-7833
- [8] ***, Green paper – Update/Upgrade of Energy Development Strategy of the Republic of Croatia for the period until 2020, October 2008
- [9] ***, Annual Energy Report Energy in Croatia, Ministry of Economy, Labour and Entrepreneurship, Energy Institute Hrvoje Pozar, Zagreb, 2008
- [10] ***, Republic of Croatia Energy Sector Development Strategy (OG 130/09)
- [11] ***, CARDS 2004 Project Approximation of EU Renewable Energy Legislation and Energy Efficiency Labelling, www.releel.mingorp.hr

Paper submitted: December 29, 2009

Paper revised: June 2, 2010

Paper accepted: June 3, 2010